THE LARGE TOLBACHIK FISSURE ERUPTION IN 1975-1976, KAMCHATKA

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ABSTRACT

This paper discusses the results of seismological, geodetic, geophysical, geologic and petrologic investigations of the large Tolbachik fissure eruption which occurred from July 6, 1975 to Dec. 10, 1976 in Kamchatka. The eruption proceeded first in the region of North vents (July 6-Sept. 15, 1975) where the character of its activity was predominantly explosive and then after a short repose period started again in the region of South vent where its activity was predominantly effusive with outpouring of fluid lava. The total volume of erupted products is 2.3 km^3. The time and locality of eruption were successfully predicted according to the character of a swarm of earthquakes recorded at depths from 0 to 20 (30) km. Furthermore, based on a characteristic decrease of the number of earthquakes

at the end of swarms preceding the formation of eruptive centers, the time of formation of some cones in the regions of North and South vents was predicted also. The dimensions of the feeder dykes in the region of North vents were evaluated based on horizontal crustal deformations. Their thickness is more than 1 m, the visible length is not more than 400 m. The overpressure of magma and gas is 100 to 300 kg/cm^2. In the course of eruption during a short period of time there was observed a successive change in basalt composition from high-magnesian of moderate alkalinity (North vents) through intermediate to aluminous subalkaline (South vent). Geologic and petrologic data testify to independence of two contrasting in composition basalt magmas. Basalts of intermediate composition are a product of mixing of these magmas. The main feeding source of basalts ejected from the North and South vents was a system of connected intermediate chambers located in the lower crustal layers or in the crust-mantle transition layer. It has been established that during the eruption in the region of North vents a system of peripheral magma chambers formed in the upper crustal layers at depths of 2-3 and 7-8 km. These chambers are considered to be the possible places of magma mixing.